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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/791,334

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Gi Youl Kim

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EXAMINER

TUROC, DAVID P

ART UNIT

PAPER NUMBER

1792

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/791,334

**Applicant(s)**

KIM ET AL.

**Examiner**

DAVID TUROCY

**Art Unit**

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 December 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 and 25-33 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 and 25-33 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SI-108)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments filed 12/4/08 have been fully considered but they are not persuasive.

The applicant has argued against the Derderian et al. reference, stating that the reference does not sufficiently or effectively disclose a dose that is insufficient to result in a maximum saturated ALD deposition rate on the wafer. The applicant argues that the reference stating that because an initiation layer is not fully saturated does not mean that the dose is insufficient to result in a maximum saturated deposition rate. The examiner disagrees. The figures show an ALD process that includes supplying a dose that does not result in saturation and thus the dose must be insufficient to result in a maximum saturated deposition rate. The examiner maintains the fact that the reference discloses doses that results in not saturated film insufficient to result in a maximum saturated deposition rate. The applicant argue that the absence or presence of a complete initiation layer says nothing about the rate at which the layer is deposited. However, the examiner notes that the claims are not generally teaching a deposition rate, but rather a maximum saturated deposition rate and therefore it remains the examiners position, absent a factual showing to the contrary, that a non saturated film does not result in a maximum saturated deposition rate.

The applicants own specification is contrary to the present arguments, specifically, 0007 discloses "We refer to the ALD deposition rate (in A/cycle) as a maximum saturated ALD deposition rate when both precursor exposure doses are

sufficient to achieve saturation for both precursors." This statement supports the applicants position, if the dose is not sufficient to achieve saturation then the dose is insufficient to achieve maximum saturated ALD deposition rate.

Applicant has argued against the Park reference, stating that the reference fails to provide a substantially uniform thin film because they use a specific injector. The examiner disagrees. Park explicitly discloses better uniformity over larger areas of the substrate (0005) and explicitly discloses "process control and uniform deposition . . . can be achieved" (0007). Additionally, the examiner notes that the claims are broadly claimed "substantially" uniform and a film that is substantially uniform is not equivalent to uniform film because substantial broadens the scope of uniformity to include a certain degree of nonuniformity. Therefore it is unclear how the applicant is arguing that the film is not substantially uniform. The argument with regards to the

The applicant has argued against the Park reference, stating that the reference does not teach use of a precursor does selected so that the film growth rate is substantially at the maximum value. However, the examiner disagrees. Since the dose that results in maximum growth rate as in the applicant's claimed process is disclosed as simply a function of the precursors utilized and the length of pulses, and Park teaches the claimed process steps (including equivalent times and process gases), Park would have inherently produced a dose sufficient to results in a film growth rate at a maximum value unless essential process steps and/or limitations are missing from the applicant's claims. The mere observation of still another beneficial result of an old process cannot form the basis of patentability. *Allen et al. v. Coe*, 57 USPQ 136; *In*

*re Maeder et al.* 143 USPQ 249. Therefore the fact that Park does not explicitly state that the process gases are supplied at a dose that results in maximum saturated deposition rate does not disqualify the reference because Park does disclose the claimed process steps (including equivalent times and process gases). At the very least selecting dose so as to reap the benefits of a maximum deposition rate would have been obvious to one of ordinary skill in the art to reap the benefits of increase film deposition efficiency and thus increase throughput, a substantial benefit desired in the semiconductor processing industry.

All other applicants arguments not specifically addressed are deemed unpersuasive because they are either 1) unsupported by factual evidence and are thus deemed moot as mere attorney speculation or 2) not commensurate in scope with the claims.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

3. Claims 1-18, 25-33 are rejected under 35 U.S.C. 102(a) as being anticipated by US Patent Publication 20020160585 by Park et al., hereafter Park.

Park discloses a method for forming a film by ALD method including exposing the first precursor dose to the substrate, thereafter exposing the wafer to the second

chemically reactive group to provide a uniform coating (figures, 0086). Park discloses supplying a first and second reactant without a purge, multiple times, and discloses a first reactant for 0.5 seconds and a second reactant for 1 second (0086, figures). Park discloses TMA and H<sub>2</sub>O as the reactants respectively (0086).

Park fails to disclose a dose of the first or second precursor insufficient to result in maximum deposition rate or starved deposition. However, the Park teaches each and every process step and limitation of the applicant's claims, including the length of time for introducing the precursors into the process chamber as well as the claimed reactants. Since the dose insufficient to result in maximum deposition by the applicant's claimed process is disclosed in the disclosure as simply a function of the precursors utilized and the length of pulses, and Park teaches the claimed process steps, Park would have inherently produced a dose insufficient to result in maximum deposition unless essential process steps and/or limitations are missing from the applicant's claims.

Claims 2-3: These claims are discussed above.

Claims 4-6: Park discloses repeating first and second precursor pulses without a purge between them (0086).

Claim 7: Park discloses a time period and

Claims 8-9: Park discloses purging between reactive gases is known and suitable in the ALD art (0022). The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of

obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Claim 10: Park discloses a precursor that is insufficient to result in saturating deposition on the wafer (0086).

Claim 11: Park discloses TMA and H<sub>2</sub>O as the reactants respectively (0086).

Claim 12: Park discloses 350°C (0086).

Claim 13-14: Park discloses 20 mTorr (0086) and discloses 230 mTorr (0022) as ALD deposition operable pressures using TMA and H<sub>2</sub>O. The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Claim 15-16: Park discloses a first reactant for 0.5 seconds and a second reactant for 1 second (0086).

Claim 17: Park discloses delivering reactants substantially uniformly over the wafer (figures).

Claim 18: Park discloses repetition of first and second reactants (0086).

Claim 25: Park discloses all that is taught above, as for the requirement regarding the second precursor exhibiting saturating characteristics, however, as discussed above, Park discloses the claimed TMA and H<sub>2</sub>O and therefore at least the first precursor exhibits saturating characteristics as required by the claim. Park fails to disclose the requirement of film growth rate at a maximum value. However, the Park teaches each and every process step and limitation of the applicant's claims, including

the length of time for introducing the precursors into the process chamber as well as the claimed reactants. Since the dose that results in maximum growth rate as in the applicant's claimed process is disclosed as simply a function of the precursors utilized and the length of pulses, and Park teaches the claimed process steps (including equivalent times and process gases), Park would have inherently produced a dose sufficient to results in a film growth rate at a maximum value unless essential process steps and/or limitations are missing from the applicant's claims.

Claim 26, 28-33: Park teaches the claims limitations as discussed above.

Claim 27: Park discloses no delay in first and second precursors (figure 3).

4. Claims 1-2, 8-13, 18 are rejected under 35 U.S.C. 102(a) as being anticipated by US Patent 6458416 by Derderian, hereafter Derderian.

Derderian discloses a method for forming a film by ALD method including supplying a first dose of a first precursor that is insufficient to result in maximum saturation, and a second precursor to form a uniform film (see figures).

Claim 2: Derderian discloses a second precursor insufficient to result in maximum ALD deposition rate (See figures).

Claims 8-9: Derderian discloses purging between the process gases (Column 6, lines 20-38).

Claim 10: Derderian discloses a third precursor that is not sufficient to result in chemical saturating deposition (figures).

Claim 11-13: Derderian discloses TMA and H<sub>2</sub>O at a temperature of 300°C and a pressure of 200 mTorr (Column 6, lines 20-38).



Claim 18: Derderian discloses repeating the process to form a film (Column 6, lines 20-38 for example).

### ***Conclusion***

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **DAVID TUROCY** whose telephone number is (571)272-2940. The examiner can normally be reached on Monday-Friday 8:30-6:00, No 2nd Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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